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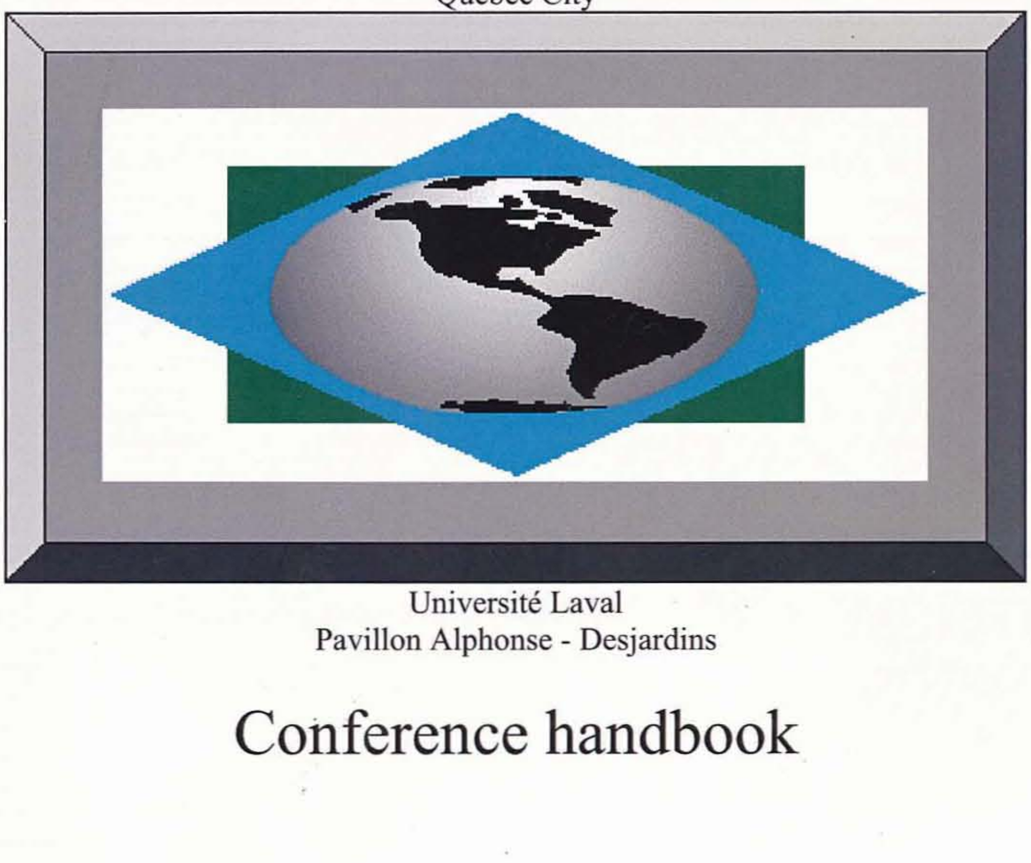

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COSMOS, an individual-based model to improve spatial management of *Cosmopolites sordidus*

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Although few studies use Individual-Based Models to explain epidemiology of pests, individual-based models (IBM) offer interesting perspectives in the domain of agricultural pest management, especially when the behaviour of the pest is of importance, e.g. in interaction with agricultural practises and environment. A stochastic IBM called COSMOS was developed to simulate the epidemiology of *Cosmopolites sordidus* in banana fields. COSMOS is based on simple rules of local movement of adults that is function of distance to banana plant, density-dependent egg-laying of females, stage-dependent development and mortality of agents, and infestation of larvae inside the banana plants. All developmental stages of *C. sordidus* are in interaction with banana plants. Development of *C. sordidus* and banana plants are temperature dependent. The model was validated and an exhaustive sensitivity analysis using the Morris method was performed. The model helps us to understand how different spatial arrangement of banana plants affects epidemiology of *C. sordidus*. COSMOS shows that planting in patches should limit the time necessary for the pest to colonize a new field, in comparison to a regular planting, but attacks might be more severe in patches after two or three cropping cycles. A pheromone trapping module allows exploring the effect of spatial clustering of populations on trapping efficiency. We tested the effect of different spatial arrangements of banana plants on the epidemiology of *C. sordidus*. Our simulations show that planting in patches with a large distance between patches should limit the time necessary for the pest to colonise a new field although the severity of attacks may increase when banana plants are planted in patches. We also tested different density of traps, our simulations show that the optimal density of traps is at about 16 traps per hectare; the control of damages is not improved beyond this value.

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